UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

APRIL 1949

EROSION CONTROL PRACTICES DIVISION

Control of Weeds on Fallow by Chemicals - Torlief S. Aasheim, Havre, Montana.-"Even though 2,4-D did not effectively control Russian thistles on sprayed plots last summer, it apparently prevented the formation of viable seed. Plots which were left idle last summer became green with Russian thistles early this spring, but plots which were sprayed with 2,4-D last summer had very few Russian thistles growing up to the time of seeding this spring.

"Stubble plots which were sub-tilled last fall immediately after harvest have less weeds growing in them at the present time than plots which were not cultivated last fall. This is apparently due to more favorable conditions for weed germination on plots which were not fall tilled. This conclusion is reached because plots which were fall sprayed seem to have as many weeds growing in them as untreated plots. Both fall spraying and fall tillage treatments stopped weed growth immediately, so the difference is not due to the fact that seed was formed on one treatment and not on the other.

General Observations on Stubble Burning in Relation to Wind Erosion - "Considerable burning of stubble has taken place in northern Montana this spring. In many cases stubble fires have spread to adjacent range lands and burned off large acreages. The worst soil blowing observed this spring occurred on fields that had been burned off and not yet cultivated. Soil blowing on some of these fields was bad enough that seeding operations could not be continued."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Soil and Water Losses in Relation to Land Management - O. E. Hays, LaCrosse, Wisconsin.-"Precipitation at the LaCrosse Station in March was 3.18 inches, nearly twice the normal of 1.61 inches for LaCrosse. All of this occurred after March 20. A warm period during the first ten days of the month removed most of the winter's accumulation of snow and ice and the rains and warm weather during the last ten days removed all frost from the ground. Low temperature for the month was 4° above zero on March 1, the high was 59° on the 24th.

"The rains that occurred during the last two weeks of the month fell on partially thawed soil. These rains were of relatively low intensity but due to the low permeability of the forzen soil, much of the rain was lost as runoff. The following table shows soil losses and runoff from strip cropping and contoured land during this period.

Treatment	Soil Loss T/A	Runoff - Inches
Plowed hay land (contoured).....	0.22	0.76
Strip cropped, plowed hay on bottom strip..	1.14	1.26
Plowed corn stubble (contoured).....	6.26	1.27
Strip cropped, plowed corn stubble on bottom	3.52	0.83
Hay land (contoured).....	0.74	0.38
Strip cropped, hay on bottom strip.....	0.40	0.62

"These data show the effect of strip cropping and soil condition on soil losses. Losses from plowed hay land were relatively low but where plowed hay land was below hay, the soil loss was more than one ton per acre. The increased runoff from the hay flowing over the plowed hay caused the high soil loss.

"On plowed corn land the highest soil loss occurred on the contoured plot. Plowed corn land is of such poor structure that losses were high whether contoured or strip cropped although the loss from the contoured plots was twice that of the strip cropped plots."

Soil Erosion in Relation to Protein Content of Wheat - Hugh C. McKay, St. Anthony, Idaho.-"The problem of low protein content in our winter wheat in this area is serious and our farmers are very worried about it. The lower protein content in our wheat is due to a decrease in organic matter and nitrogen in our soil. This condition has been brought about by two factors, cropping and erosion. The effect of cultivation and erosion on the protein in our wheat crop is shown in the following table:

Area	Soil	% Protein		
		Virgin	Cultivated	Eroded
Ashton	Walla Walla Silt Loam	14.42	13.13	11.83
Downey	Buckskin	12.57	12.37	10.73
Preston	Oxford	12.13	11.85	10.13
Bancroft	Bancroft	14.24	11.49	11.19
Average		13.34	12.21	10.97

"The data in the above table shows that in every soil tested there is a reduction in the amount of protein produced in the cultivated and eroded soils as compared to the virgin soil. The average protein for the cultivated soils is 1.13% less than the virgin and the eroded soils is 2.37% less than the virgin soils. Much of our area is producing wheat that has a protein equal to or less than the eroded samples. This would seem to indicate that erosion has taken a more serious toll than originally thought. Wheat with a protein of around 10% or less is a poor milling wheat and has to have a higher protein wheat blended with it, so it can be seen that the problem is acute."

Winter Injury of Wheat in Relation to Land Management - Hugh C. McKay, St. Anthony, Idaho.-"The problem of winter kill on our winter wheat due to snow mold and snow scald was especially serious this year. This presents a serious problem to our stubble mulch program, because in the areas where winter kill is prevalent, following a stubble mulch program causes an increased loss of wheat. This was quite evident this year. The stubble and trash on the surface of the soil seems to act as a carrier of the organisms causing the winter kill. This is true in the higher areas where snow seems to stay on the ground longer. In the lower areas where the snow leaves a month earlier trash on the surface does not seem to increase the winter kill.

"On the station severe winter kill occurred on all of the stubble mulch plots, while the plots right beside them with the straw burned has a 95% stand of wheat.

"The rotation plots where we had plowed down a green manure crop of sweet clover and alfalfa came through with a good stand. This has also been true in previous years. The straight grass plot had a 100% winter kill of the winter wheat. One farmer who has been raising sweet clover, cut several rounds around the field for hay, the rest of the sweet clover he turned down as a green manure. The first crop of wheat seeded last fall, showed winter kill this spring up to the place where he turned the sweet clover down as a green manure. The wheat seeded on the green manure ground showed a 100% stand.

"The seriousness of this problem is further emphasized by the fact that several of the farmers who have been using stubble mulch tillage found that their neighbors who had been using the moldboard did not have to reseed, went to town and bought themselves a moldboard plow.

"This problem is serious and should be given detailed study."

Preliminary Results of Killing Sweetclover with 2-4,D - J. R. Johnston, Temple, Texas.-"Experience with biennial sweetclovers during recent years shows that these deep-rooted legumes have definite uses in a conservation and production program for this area. When the biennial sweetclovers are interplanted with winter grain (in late fall) they live through two winters before making their major seed crop. When they are used in this manner they provide excellent soil cover during the second winter. The late winter and early spring growth during the second year should prove to be an excellent green manure crop. The physical condition of these heavy clay soils in the second spring under this crop appears to be excellent. The highly interesting possibility of killing the sweetclover plants with growth hormones presents itself. If the plants could be killed in this manner the residues would be left on the soil surface, the root organic channel from the immediate surface downward would be kept intact, and the seedbed would remain undisturbed. A preliminary replicated experiment on the use of 2-4,D for disposing of 2nd-year growth of evergreen sweetclover started during the month. Three rates of the acid were used - - 1, 2, and 4 lbs. per acre. Top growth of the sweetclover was killed by all treatments. Sufficient time has not passed to determine if all crown and root growth can be stopped by this treatment."

Weevil Threatens Use of Sweetclover in Short Rotations - F. L. Duley, Lincoln, Nebraska.-"Second-year sweetclover is being damaged by sweetclover weevil and it has been necessary to treat the fields with DDT. This weevil pest has become widespread in this region and threatens the use of sweetclover in short rotations. Sweetclover has come to be one of the most satisfactory legumes to be used with the stubble-mulch system; it is therefore of the utmost importance that methods of controlling the pest be developed."

Snow Ridging in Relation to Soil Moisture - C. L. Englehorn, Fargo, North Dakota.-"Soil moisture determinations were made on samples obtained at Bottineau from fields on which snow had been ridged during the winter and from unridged fields. Ridging was by means of a snow plot for the purpose of accumulating more snow during subsequent storms. The average percent of soil moisture under ridging was 33.1 in the surface soil and 22.6 in the subsoil. In the non-ridged field the surface soil contained 26.8 percent and the subsoil 22.4 percent of moisture. The effect of extra snow accumulation did not extend into the subsoil. Roughly the surface soil of the ridged field contained 1 inch more moisture for each foot in depth than did that of the unridged field."

Earthworm Population Under Different Winter Treatments - O. R. Neal, New Brunswick, New Jersey.-"Some preliminary results have been obtained from a study of the influence of winter mulch and cover crop on earthworm population and on physical condition of the soil.

"A cultivated strip 200 x 50 feet in size was divided in 8 plots 50 x 25 feet. Mulch was applied in September of last year on 4 plots. Two plots were seeded to a cover crop of wheat, and 2 plots were left fallow over winter. The earthworm population in April under these treatments is shown in the following table.

Treatment	Earthworms	
	No./A.	Lbs./A. - Live weight
Mulch	544,000	720
Cover crop	261,000	158
Fallow	207,000	168

"Variations in numbers and size of earthworms at different sampling locations were wide within treatments as well as between treatments. In general, however, populations were much higher under the mulch treatment.

"Aggregate analyses of soil from the different treatments indicate a higher percentage of water-stable aggregates from the mulched areas. The relative differences in percentage aggregation averaged considerably less than the differences in earthworm population."

Organic Matter and Aggregation Data for Plots at the Arnot - John Lamb, Jr., Ithaca, New York.-"This is the second year of 'rest' under sod for the control plots at the Arnot Station. A comparison of organic matter and aggregation data for 1946 and the fall of 1948 is given in the following table:

Treatments 1935-1946	Erosion 1935 - 1946 tons per acre	Organic matter, per cent		Degree aggregation	
		1946	1948	1946	1948
Idle	2	4.6	5.0	86	94
Meadow fertilized	0	4.5	4.8	83	94
Rotation - sweet clover and potatoes	13	4.1	4.5	75	90
Rotation - corn, oats, clover fertilized	3	4.7	4.9	79	92
Rotation - corn, oats, clover unfertilized	8	3.8	4.2	80	90
Continuous corn - fertilized	34	3.1	3.6	67	86
Continuous corn - unfertilized	48	3.0	3.3	68	86
Fallow, stones in place	74	3.0	3.3	67	86
Fallow, stones removed	138	2.9	3.2	61	88

"Organic matter and aggregation show improvement, but it will be noted that the effects of past management and erosion have by no means disappeared. These data were furnished by Mr. E. A. Carleton."

Report of Dust Bowl Conditions - May 15, 1949 - H. H. Finnell, Goodwell, Oklahoma.-"During the first part of May, most of the southern High Plains received more than normal rainfall, while hail storms and high winds are damaging wheat in widely separated areas on the usual local basis. It would seem at this time, from the observations and comments available, that the wheat farmers have already decided upon the most advantageous abandonment and have put that behind them. The big worry just now is the possibility of a wet harvest. The large acreage, the comparatively high yield in prospect, and super-normal rainfalls are all aggravating the grain storage problem, in spite of the fact that new elevators are being rushed to completion everywhere you go in the southern plains grain country.

"Reports of occasional spring stubble burning in northern areas is a hint to southern Great Plains district personnel that it may not be too early to start a campaign of precaution against accidental and intentional wheat field and stubble field fires, which usually plague their part of the country beginning with harvest time (that is, if the weather should suddenly change pace and turn off a dry harvest and summer preparatory period.)

"In parts of the Texas-New Mexico sandy row crop areas along the southern extremities of the Great Plains, wind and drouth problems have given away to those of excess moisture, drowning, washing out or covering recent row crop plantings.

"This will be the next to the last of our semi-monthly reports to the Chief for the current season. If any of the Soil Conservation Service personnel who receive this report regularly have comments to offer, critical or otherwise, we would like to have them by return mail, along with your request to be continued on or dropped from our mailing list when these reports are resumed next fall."

Stubble Mulch Studies- C. J. Whitfield, Amarillo, Texas.-"There was a noticeable difference in the appearance of the stubble mulch plots at the close of the month of April. Wheat on the sub-tilled plots was somewhat shorter and of a lighter color compared to that on the plots tilled with the moldboard and one-way plows. This condition would have been anticipated in view of the fact that soil tests made during the last half of March showed the subtilled plots to be running low in available nitrogen. The comparative amounts of dry weight of plant material on the various plots are given in the accompanying table and show about 60 percent more forage on the moldboard plow than on the sub-tilled plots.

"Wheat on plots in the wheat-fallow-wheat system cultivated by the one-way plow, by subtillage, and by delayed sub-tillage (by delayed sub-tillage is meant fallow in which the first operation by subtillage is not made immediately after harvest in the conventional manner but is delayed until approximately April 1) was similar in appearance and of a uniform dark green color. There was about 19 percent more forage on the subtilled than on the one-way plots. There was no appreciable difference in the amount of plant material harvested from the delayed and conventional sub-tilled plots.

Table 1.--Mean dry weights of wheat plants on stubble mulch plots at Amarillo on April 25, 1949.

Tillage Method	Mean dry weight Pounds per acre
	Continuous wheat
Oneway plow	1217
Moldboard plow	1674
Subtillage	1070
	Wheat-fallow-wheat system
Subtillage	3222
Delayed subtillage	3528
Oneway	2744

"On March 24, forty-four steer calves were purchased for use in the summer grazing studies, to begin May 1. On March 25, the entire group was placed on 44 acres of crested wheatgrass where they remained for a month, making an average daily gain of 2.65 pounds. This was considered to be an excellent rate of gain, especially in view of the fact that the calves had been wintered on wheat pasture and were in good condition when they were placed on crested wheatgrass.

"Lot 1, two-year-old steers, made an average daily gain of 1.29 pound on reseeded pasture during April."

Upland Pastures - B. H. Hendrickson, Watkinsville, Ga.-"Kudzu and sericea new growth was killed back by frost on April 16. All winter legumes made excellent growth during the past very mild winter, and are now in bloom stage."

Legumes that Produce Good Volunteer Stands on Crop Land - E. C. Richardson.-"In the reseeding legume study at North Auburn, crops of Caley peas, Grandiflora vetch, and Manganese bur clover seed were produced on the land and then were followed with grain sorghum and two crops of corn. The third volunteer stand of these legumes was allowed to mature the second seed crop in early 1948. The first volunteer stand in the second cycle was turned on April 8 and 9 for corn before maturing seed. The yield results are shown in the table on the following page.

"Caley peas produced three excellent volunteer stands in the first cycle and one very thick stand in the second cycle.

"Grandiflora vetch produced two satisfactory volunteer stands and a third thin volunteer stand in the first cycle. The first volunteer stand in the second cycle was satisfactory, but not as thick as the first volunteer stand in the first cycle. Seed production in 1948 was less than in 1945.

Yield Data of Volunteer Caley Peas, Grandiflora vetch, and Bur Clover

Year	Estimated Yield of Caley pea seed produced per acre	Green weight pounds per acre	Yield of crop bushels per acre	Estimated yield of vetch seed produced per acre	Green Weight pounds per acre	Yield of crop bushels per acre	Estimated yield of bur clover seed production	Green weight pounds per acre	Yield of crop bushels per acre	Turning date of winter legume
1945	1000-2000	-	48.2[1]	300-500	not determined	47.7[1]	-	not determined	40[1]	June 15
1946	none	16,000	64[2]	none	21,000	60[2]	none	6,000	40[2]	April 4
1947	none	19,520	48.6[2]	none	15,260	51.4[2]	none	3,000	25[2]	April 22
1948	600-900	13,516	45[1]	200-400	5,668	38[1]	-	3,000	25[1]	-
1949	none	26,160	-	none	14,824	-	none	13,436	-	April 8

(1) Grain sorghum

(2) Corn

"The stand of bur clover obtained from the initial seeding was satisfactory. Volunteer stands for three years in the first cycle were inadequate for ground cover or for soil building. The first volunteer stand of bur clover in the second cycle was irregular--growth was greatly improved but still inadequate for ground cover or soil building."

PLEASE NOTE: There was an error in Mr. C. A. Van Doren's report for the month of February 1949. On page 4, last paragraph, the figure 84 was misused for 54. It should read "Animal gains during the season were increased from 54 pounds per acre, etc."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Shattering the subsoil along with applications of 1 ton of lime and 200 pounds of 3-12-12 fertilizer per acre to depth of 14-16 inches was performed on watershed 127. The soil profile is slowly permeable. The sod will be cut up for trash mulch cornland this year. The purpose of this treatment is to conserve more water and soil through the prevention of surface sealing and the development of a better aggregated soil profile below the plow layer. Runoff, erosion, soil moisture, soil properties, and crop yields will be measured in this field which will go through a rotation of C-W-M-M.

"Mr. Dreibelbis reports that laboratory tests of different soil moisture units revealed 'short-comings' of each. Most have either not given sensitivity in the wet range of soil moisture or they have not provided sufficient contact with the soil (when dried and cracked) to transmit moisture to the units. R. E. Youker is developing in the soils laboratory an adaptation of some of the best features of some of these soil moisture units. It will be tested in the field this year and a full report given in the fall.

"Mr. Schiff presented a paper entitled 'A Report of Preliminary Studies on Soil Permeability and its Application," and a discussion of 'Flood Frequencies and Sedimentation from Forest Watersheds" at the AGU meetings.

"The paper on permeability pointed out that caution should be exercised in the application of transmission and percolation rates obtained with cores. That preferably such application should be made in the light of watershed performance. A method of obtaining infiltration rates from transmission rates and soil moisture was included in the paper. It is evident that considerable replication is necessary to establish reasonably true transmission and percolation rates with cores. The shape of the infiltration curve indicates that physical laws are operating within the soil profile and that a reasonably true average transmission rate might be established for a given horizon rather than high and low limits of transmission rates which may lead to considerable error.

"It is suggested that where relationships to watershed performance cannot be established, consideration be given to information developed at Coshocton.

"Another paper now being prepared provides a method for estimating surface runoff supplies based on antecedent soil moisture, knowledge of transmission rates and corresponding infiltration rates, and storm patterns.

"The discussion quoted some results from the Coshocton reforested watersheds indicating that in some regions reforestation will reduce surface runoff and increase sub-surface flow. Table below shows this.

Table 1.--Peak discharge for reforested watersheds No. 172 and No. 134

Date	Watershed No.	Area	Cover	Peak Discharge	Remarks
		Acres	Percent	In./hr.	
7-8-39	134	0.92	10	1.45	
	172	43.6	10	.60	There was a much greater
5-22-41	134	.92	20	.77	change in cover than in other
	172	43.6	20	.60	storm and watershed variables
5-30-43	134	.92	40	.18	affecting discharge for the
	172	43.6	40	.24	period shown.
9-23-45	134	.92	80	.07	
	172	43.6	80	.35	
6-16-46	134	.92	95	.10	
	172	43.6	95	.72	

"As cover increased from 10 percent protection to 95 percent surface flow greatly reduced as indicated by reduction of peaks on watershed No. 134 from 1.45 inches per hour to 0.10 inch per hour. Whereas, flood peaks on the larger area did not greatly change in the same period. The floods for 95 percent cover came mostly from sub-surface storm flow."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"Considerable progress was made during the month in placing watershed W-5 under a conservation program. Cross sections and profiles were made on the waterways in the area and the waterway design was based on the Stillwater, Okla., and Hastings data. A bulldozer and a grader was used approximately 70 hours during the month in shaping the waterways, preparatory to seeding. Terrace and contour lines were staked out by Operations personnel."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"The table on page 12 summarizes soil and nutrient losses for three storms listed and discussed in the March 1949 monthly report. Only those watersheds in wheat are included in the table because erosion losses on all other watersheds whether in new or mature meadow were negligible (less than 50 lbs. per acre loss). An exception was the loss from those watersheds which had had a recent application of farm manure. On these watersheds total solids averaged 62 lbs. per acre and the organic matter and nitrogen were high, averaging 24.4 and 2.3 lbs. per acre, respectively.

Table 1.--Soil & Nutrient Losses by Erosion from Cropped Watersheds
Selected Storm Periods
Storm of 1/18/49
Purdue-Throckmorton Farm, Lafayette, Indiana

Crop	Treatment	Wsd. No.	Composition of runoff, lbs./acre: Total solids	Organic matter 1/	N 2/	P_2O_5 3/	K_2O 4/	$CaCO_3$	$MgCO_3$	Runoff Inches
Wheat	Prevailing	4	77	11.1	0.35	0.08	0.29	2.9	0.8	0.409
		12	511	33.8	.33	.10	.23	5.0	1.4	1.092
		Mean	294	22.5	.34	.09	.26	4.0	1.1	.751
	Conservation	2	333	22.8	.73	.16	.60	3.9	1.8	.734
		11	85	14.9	.69	.12	.40	4.0	1.1	.573
		Mean	209	8.8	.71	.14	.50	4.0	1.0	.654
Mean	Treatment Difference		85	3.7	-.37	-.05	-.24	0	0.1	.097
			Storm of 2/14 - 2/15-49							
Wheat	Prevailing	4	726	34.1	2.47	.17	.43	9.1	2.2	.726
		12	1183	64.4	4.11	.29	.63	11.6	4.7	1.370
		Mean	954	49.2	3.29	.23	.53	10.4	3.4	1.046
	Conservation	2	1273	57.5	3.71	.44	.93	13.4	3.7	.927
		11	298	18.2	1.15	.13	.38	3.1	1.3	.444
		Mean	786	37.8	2.43	.28	.66	8.2	2.5	.685
Mean	Treatment Difference		168	11.4	0.86	-.05	-.13	2.2	0.9	.363
			Storm of 3/26/49							
Wheat	Prevailing	4	238	12.1	.79	.03	.16	2.6	.7	.143
		12	128	8.2	.48	.02	.14	1.8	.8	.199
		Mean	183	10.2	.64	.02	.15	2.2	.8	.171
	Conservation	2	250	13.6	.81	.08	.34	2.9	.6	.198
		11	29	2.2	.14	.01	.07	.5	.2	.053
		Mean	139	7.9	.48	.05	.20	1.7	.4	.125
Mean	Treatment Difference		44	2.3	.16	-.03	-.05	0.5	0.4	.046

1/ Organic Matter - Method of Schollenberger - modified. Ref. Soil Science 59:53, 1945.
2/ Nitrogen - Modified Kjeldahl method.
3/ Phosphorus - Bray's method 4. Soil Science 59, 39-46, 1945. Preliminary results indicate that when the phosphorus in the organic form is included the total losses are two to three times the losses given in this table.
4/ Potassium, calcium and magnesium extracted with 1N ammonium acetate solution.

"The negligible losses from the meadow again emphasize the effectiveness of cover in reducing erosion losses during winter and spring storms even though runoff losses may not be reduced appreciably.

"The effectiveness of the conservation treatment was not sufficient during this period to consistently overcome certain natural disadvantages which existed on the conservation watersheds at the time of their selection."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.- "During the month, nylon and plaster of Paris moisture determining blocks, after Bouyoucos, were received for incorporation in the study of a continuous record of soil moisture variations at different depths. These blocks were tested under water for inherent resistance at saturation, and were found to have (even with 70 foot leads attached) the relatively minor saturated resistances of 70 - 80 ohms, for the nylon blocks, and 320-340 ohms, for the plaster of Paris blocks. Sites for the installation of these blocks were definitely selected. They will be placed at 60 inches, 36 inches, 24 inches, 12 inches, 6 inches, and 3 inches in each of watersheds A and B, and at 36 inches, 24 inches, 12 inches, and 6 inches, in the instrument enclosure (for continuous grass cover) between the lower ends of the two watersheds. The recorder will be mounted within the present instrument house. Contrary to general opinion, a way has been devised to permit the installation of another instrument in said instrument house, without the necessity of mounting 'sideboards' on the house. It is anticipated that the new recorder will be received about June 1. At an early date, it is anticipated that the blocks will be installed to 'season'. Slight modifications of Dr. Bouyoucos' own technique are anticipated in the installation thereof, but his method will be fundamentally followed."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"Table 1 shows the rainfall and runoff for the areas Y, Y-2, W-1, and W-2 for the month of April and for the storm of March 21, when there was approximately 2 inches of rainfall. This storm of March 21 was the only storm prior to April 1 causing appreciable amounts of runoff during 1949. In this table under the column, 'Rainfall minus Runoff,' is shown the amount of precipitation retained upon the areas. It will be noted that there is relatively little difference between the areas in the total amount of water retained. The area W-2 did have an appreciable amount of runoff from the storm of April 27, and, because the rainfall was less in this area, the total retention for the area W-2 is somewhat smaller than for the other three areas. The rates of runoff have continued to be appreciably lower for the areas with conservation practices. The maximum peak rates of runoff for

Table 1.--Rainfall and runoff by watershed - March 21, and April, 1949

Date	Areas with conservation practices: Area Y - 309 acres: Rainfall	Runoff	Rainfall less runoff	Area Y-2 - 132 acres: Rainfall	Runoff	Rainfall less runoff	Areas without conservation practices: Area W-1 - 176 acres: Rainfall	Runoff	Rainfall less runoff	Area W-2 - 130 acres: Rainfall	Runoff	Rainfall less runoff
3/21	1.946	0.0940	1.852	1.903	0.0516	1.8514	2.034	0.2610	1.7730	2.154	0.2884	1.8656
4/1	.214	T	.2140	.222	None	.2220	.222	.0001	.2219	.242	.0006	.2414
4/2	.046	T	.0460	.042	None	.0420	.042	.0002	.0418	.040	.0026	.0374
4/3		None			None			T			.0014	-.0014
4/4	.126	None	.1260	.128	None	.1280	.125	.0002	.1248	.126	.0020	.1240
4/5		None			None			.0001	-.0001		.0016	-.0016
4/6		None			None			T			.0008	-.0008
4/7		None			None			T			.0003	-.0003
4/8		None			None			None			.0001	-.0001
4/9	.493	T	.4930	.490	None	.4900	.468	.0004	.4676	.440	.0019	.4381
4/10	.020	T	.0200	.020	None	.0200	.020	.0003	.0217	.030	.0038	.0262
4/11		None			None			.0001	-.0001		.0015	-.0015
4/12		None			None			.0001	-.0001		.0010	-.0010
4/13		None			None			.0001	-.0001		.0006	-.0006
4/14		None			None			T			.0002	-.0002
4/15		None			None			None			None	
4/16		None			None			None			None	
4/17		None			None			None			None	
4/18		None			None			None			None	
4/19	.702	.0001	.7019	.713	None	.7130	.732	.0006	.7314	.712	.0009	.7111
4/20	.446	.0004	.4456	.437	None	.4370	.438	.0036	.4344	.428	.0138	.4142
4/21	.008	T	.0080	.012	None	.0120	.010	.0004	.0096	.016	.0030	.0130
4/22		T			None			.0003	-.0003		.0021	-.0021
4/23		T			None			.0004	-.0004		.0021	-.0021
4/24	.322	.0002	.3218	.315	None	.3150	.260	.0007	.2593	.208	.0029	.2051
4/25	.558	.0041	.5539	.552	None	.5520	.567	.0085	.5585	.542	.0237	.5183
4/26		.0006	-.0006		None			.0016	-.0016		.0062	-.0062
4/27	1.065	.1992	.8658	1.088	.1895	.8985	1.261	.3511	.9099	.940	.1922	.7478
4/28	.094	.0271	.0669	.086	.0161	.0699	.090	.0298	.0602	.108	.0240	.0890
April Total	4.096	.2317	3.8635	4.105	.2056	3.8994	4.237	.3986	3.8401	3.832	.2893	3.5427

the four areas for the storms of March 21 and April 27, in inches per hour, were as follows:

DATE	Y	Y-2	W-1	W-2
March 21	.0500	.0310	.200	.189
April 27	.160	.179	.627	.192

"The fact that retention is not higher on the areas with conservation practices than on untreated areas is difficult to explain satisfactorily. For some storms the areas with conservation practices do have an appreciably higher retention, but this condition apparently did not exist at the time of the storm of April 27. It may be that the small rains for the period April 19 to 25 had saturated surface soils, so that the infiltration rates on all areas were nearly the same. Soil moisture observations have given some indication of greater penetration of moisture in the areas with conservation practices. This condition is not very definite, but may be the explanation for the small increase in retention for areas with conservation practices."

Hydrologic Studies - E. H. Kidder, Auburn, Alabama.-"The total rainfall for the first 27 days of the month was 2.92 inches, which is two-thirds of the 68-year average rainfall of 4.40 inches for April. A rainfall of 6.06 inches was recorded during a 28-hour period on the 28th and 29th. The precipitation recorded during a 24-hour period was 5.68 inches. The 24-hour rainfall would classify the storm as a-once-in-11-year frequency (Yarnell). The total precipitation for the month was 8.98 inches, which is 104 percent in excess of the 4.40-inch average.

"All of the runoff catchment tanks on the 2, 5, 10, 15, and 20 percent slopes were flooded out. Since these tanks have a capacity of approximately 3 inches of runoff, the runoff for individual plots equaled or exceeded 50 percent. The runoff tanks on the 10 percent slope plots were flooded after 4.18 inches of rain had fallen. The runoff from these plots at that time was in excess of 70 percent.

"The 2, 5, and 10 percent plots were planted to cotton on the 16th and the 15 and 20 percent plots to corn on the 17th. The soil surface was essentially smooth and the top 6 inches was in a loosened condition following seedbed preparation and planting activities.

"During the period April 27 through May 2, 6.20 inches of rain fell on the watershed of the Duncan Pond. The runoff from the watershed was 2.6 inches, which equals 42 percent of the rainfall.

"The replacement of the surface soil on all plots and on one of the tilting plots was completed during the month. Good stands of corn and cotton are present on the level and sloping plots."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore was 1.95 inches, as compared with the normal of 3.0 inches. There was no surface runoff.

"Precipitation at Edwardsville was 1.06 inches, as compared with the normal of 4.0 inches. There was no surface runoff from these watersheds. I checked the Edwardsville runoff stations on April 4 and 5, and made such adjustments as I found necessary. A new survey of the pond areas above station W-IV was also made at this time.

"The period of April 6 to 8 was spent at Urbana, Ill., discussing with members of the University of Illinois Agricultural Engineering Department, U. S. Geological Survey, and Illinois Water Survey, the location of watersheds, and the design of structures and appurtenances for the Allerton Estate watersheds near Monticello, Illinois.

"I also prepared revised instructions covering the preparation of rating tables, and compilation of runoff data. Copies of these revisions were mailed to various new runoff studies locations, and other interested persons."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Two methods were discovered for the correction of the poor flow conditions reported last month in pipe outlet structure O-4. The use of high baffle piers reduces wave heights to tolerable limits and improves flow conditions considerably both in the outlet structure and in the paved channel. However, almost ideal flow conditions were obtained by using a SAF stilling basin to dissipate the energy in the flow entering the structure from one side by means of a chute. The flow from the stilling basin entered the pipe outlet structure quietly and generated no waves so that the flow in O ditch below the structure was quite smooth. The measured depth of flow closely approximated the computed drop-down curve.

"Mr. Donnelly installed and tested pipe outlet structure A-2 after completing the tests on structure O-4. Three 36-inch pipes enter this structure symmetrically and parallel to the A ditch centerline. The model tests showed that no changes were indicated as being necessary except that the sidewalls of the channel required raising. This was anticipated since the computed drop-down curve showed that the sidewall freeboard was inadequate.

"In March Mr. Bowers reported poor flow conditions at the P-10 terrace junction structure, where the terrace is carried across P ditch and dropped into it over a side weir. Although the structure operated satisfactorily at low flows in the terrace, at high flows a considerable disturbance was created. This disturbance was almost completely eliminated by locally increasing the grade in P ditch to increase the Froude number and by using two submerged piers in P ditch.

"Mr. Bowers also completed a test of ditch junction structure P-9 where there is joined a flow of 630 cfs from P ditch and 330 cfs from O ditch. Both ditches flow at supercritical velocities with relatively low Froude numbers. The junction was designed so that the streams would pass through hydraulic jumps, be joined together at subcritical velocities, and the flow again accelerated to supercritical velocity in P ditch. The junction operated satisfactorily for all combinations of flow except for the unlikely condition when there would be a very small flow in one ditch and approximately design flow in the other ditch."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall has been somewhat higher for this period than it has been in previous years. Following is a summary of our rainfall records for April 1949:

Location, Gage	April 1949	April 1948	April 1947
Redland & Mowry	3.87	2.47	2.45
Sub-Tropical Exp. Sta.	5.65	2.57	3.72
Redland & Gossman	5.69	5.67	1.23
Plummer & Comfort	4.17	----	----
Peters, Fla.	4.63	6.18	6.72
Princeton Grove	3.15	5.74	2.52
Cooper Grove	4.51	3.91	3.68
W - Mowry	3.34	2.31	2.72
E - 33	4.62	2.14	.88
Roberts & Avocado	4.86	3.04	3.29
Jeran Grove	5.13	----	----
Country Club & Waldin	3.52	----	----

"Rains of over 1 inch occurred on the following dates: April 16, April 18, and April 19.

"As a result of light showers at the beginning and heavy rain the middle of the month we have had a steady increase in the water table for this area.

"For the Redland Profile from April 4 to April 25 increases ranged from 1.37 feet at E-33 (Highlands Water Control Plot) to 1.86 feet at the measuring point at the north end of Gossman Drive. From April 25 to May 2, the loss in elevation for the Redland Profile ranged from -0.01 foot to -0.42 foot.

"For the Eureka Profile gains in the water table from April 4 to April 25 ranged from 0.74 foot to 0.97 foot. For the period April 25 to May 2 losses for this profile ranged from 0.02 foot to 0.13 foot.

"For the Mowry Profile from April 4 to April 25 gains of 1.01 feet at the western end to 0.79 foot at #E-32 were recorded. Losses for the period April 25 to May 2 ranged from 0.15 to 0.27 foot.

"Readings at Well #5 show that our water table on April 30 was slightly higher than any previous year we have been making this study. The readings are as follows:

4-30-46.....	.41 ft.	M.S.L.
4-30-47.....	.56 "	"
4-30-48.....	1.29 "	"
4-30-49.....	1.34 "	"

"There has been from the first of the period a steady increase in the moisture content of the mulched plot area. Readings made on April 29, about a week after the last heavy rain showed a decrease in moisture for the check plot while the natural cover plot, though it showed a slight decrease in moisture, had not gone as rapidly as the check. As material accumulates on the surface the plot has the trend of the grass mulched area. While grasses do compete with tree crops for moisture, after a time they produce a certain amount of mulching material.

"Samples collected in the Miami area show that there has been for this period a rise in concentration of chlorides. While we have had a definite increase this increase is not nearly so high as it was before the barriers were put in the canals. In one case prior to installation of the structures a concentration of 50,000 P.P.M. was found; this same area has not gone over 1,500 P.P.M. during the past season. The installation and operation of the barriers has materially reduced the concentration of chlorides in this area."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.- "The long period of sub-normal rainfall which began in November 1948 and lasted through March 1949 for the Everglades, was broken by rains which occurred generally over the whole area and especially along the East Coast during the month of April. Prior to the rains practically the entire area of virgin peat soils where sawgrass was the dominant cover was swept over by fire. Fortunately, due to the water table's proximity to the surface of the soil which had retained moisture from last Autumn's floods, the actual burning of the peat was very small except for unguarded levees.

"During April the rainfall at the Everglades Experiment Station amounted to 2.71 inches, and evaporation from the standard pan was 6.401 inches.

"Field surveys were made on approximately 4-1/2 miles of peat levee belonging to the Hillsboro plantation at Shawno. Construction of this levee was begun in 1947 and completed to grade in 1948. The design specifications for the levee were available. Stations were re-established by

chaining, and levels run to set permanent bench marks. Bench marks were 10 pipes, 1 inch in diameter, 14 feet long driven into rock. Cross sections of the levee, borrow pit, and a short stretch of natural ground on both sides were made every 1/4 mile along the levee. These cross sections were plotted for future comparison, and areas of different elements of construction were planimetered to evaluate the ratio of borrow material to actual embankment and to determine the percent of disturbed material which remained in the borrow canal as sludge which could not be removed by clamshells during construction.

"An accurate estimate of the total shrinkage since initial construction could not be determined since no actual surveys were made at that time; however, it was evident from the design sections that the top of the levee had settled roughly from 1-1/2 to 2 feet. The table below gives for each section per running foot: (1) the cubic yards of material in the levee embankment as of April 1949, (2) the cubic yards of peat material actually removed and placed in the levee as measured from the borrow canal, (3) the amount of yardage of actual material removed from the borrow canal required to make 1 cu. yd. of levee embankment, (4) the cubic yards of disturbed material remaining in the bottom of the borrow canal as sludge, and (5) the percentage of peat material actually removed from the borrow canal:

Station:	Cu. yds. in actual dike April, 1949 (not compacted)	Cu. yds. of material actually removed from borrow pit	Cu. yds. of material removed from borrow to make 1 cu. yd. of levee	Cu. yds. of disturbed peat remaining in borrow pit (sludge) April, 1949	Percent of peat removed from borrow
0 +00	5.5	7.4	1.37	2.2	77%
13 +20	4.5	7.7	1.71	2.5	75
26 +47	4.0	7.1	1.77	3.1	70
39 +67	5.2	7.7	1.48	4.1	65
52 +87	3.7	7.8	2.10	2.7	74
66 +07	4.9	7.6	1.55	2.8	67
79 +27	4.6	8.6	1.87	3.1	73
92 +33	5.2	8.2	1.57	3.7	69
105+67	4.4	8.4	1.91	3.1	73
118+80	5.2	8.0	1.54	3.3	71
132+07	4.2	8.0	1.95	4.2	66
145+27	3.9	7.8	2.00	4.5	64
158+47	4.2	7.7	1.83	6.4	53
171+67	3.7	7.4	2.00	5.0	60
184+34	10.9	9.7		5.8	
197+44	3.6	7.3	2.02	5.0	59
210+47	3.3	7.8	2.36	4.6	63
223+94	3.4	7.0	2.06	4.9	59
237+14	3.5	7.3	2.08	4.9	60

"The levee begins near the Hillsboro Canal where it is built of Everglades peat fairly well oxidized, and extends due east for a distance of about 3-1/2 miles approaching the boundary line of Loxahatchee peat which lies, as mapped, 1/2 mile further east. However, there appears to be a transition zone of Everglades to Loxahatchee peat progressing eastward and considerable difficulty was experienced in construction due to the lighter, more fluffy, and less coherent nature of the peat to the east. At the 3-1/2 mile point the levee turns due north and runs parallel to the boundary between the soil types and apparently is entirely in the transition zone. The table shows that as the levee extends eastward and to the north, the ratio of yardage removed for borrow to yardage in embankment generally increases, as well as the amount of sludge that could not be removed in excavation.

"The levee had not been rolled or compacted, nor vegetated, and many shrinkage cracks were seen. Many of the crevices were 6 to 8 inches wide and appeared to extend across the whole cross section of the levee. The weight of a person's body would depress the soil 4 to 6 inches, and it is evident that additional work will be needed before the levee will function in case of a rise in water stage on the outside. The landowner plans to compact and plant the levee to grass in the next few months, and it is planned to resurvey the same course immediately afterward to ascertain the changes. It is also planned to keep track of subsidence by rerunning the lines at least annually for the next few years.

"With the aid of the office of the County Engineer of Dade County, subsidence surveys were made on 2 miles of the Dade-Broward levee in the lower part of the Everglades. These sections which are 11 miles apart, one on the extreme north end and another on the extreme south end, were rebuilt during April or May in 1948. This levee is approximately 40 feet wide at the base, 12 feet along the crown, and 6 to 7 feet high. Throughout the sections measured the levee contains approximately 20 percent hard limestone, which lies in a 2 ft. layer about midway between the base and crown.

"Soon after the peat had been placed on the embankment the levee was sprigged with para grass and compacted somewhat by running over the top with a D-6 tractor and disc harrow when planting the grass. The side slopes were sprigged and tamped by hand. By August, when the first cross sections were taken, the grass completely covered these stretches of the levee. During the following October, however, it withstood the wave action perfectly, despite the force of the hurricane winds.

"In February 1944, a steel tank 10.5 feet in diameter and 7.5 feet deep was set in the ground and soil banked around the outside to the level of water which was thereafter kept in the tank to within approximately 8 inches of the top. Daily records of evaporation from this tank have been made continuously, and compared to similar data obtained from an adjacent standard class A evaporation pan of the U. S. Weather Bureau type. Thus, a 5-year record is now available. Experiments from the western section of

the country indicate that evaporation losses from the large tank should closely follow losses from ponds, reservoirs, or other large bodies of water, and that the establishment of a ratio of the losses between the large tank and the standard pan would make available a coefficient for reducing observed evaporation from standard pans to evaporation from large bodies of water.

"At present a general coefficient of 0.70 has been recommended, and largely used in Florida. However, as a result of the 5-year record from the above described tank and pan located at the Everglades Experiment Station near Belle Glade, Florida, it appears that the coefficient 0.70 is too low for this section of the country, provided, of course, that evaporation from the 10.5 ft. tank represents closely the evaporation from large bodies of water.

"Table 1 shows a compilation of certain hydrological and climatological records obtained at the Everglades Experiment Station, including monthly evaporation rates for the standard open pan and large tank designated as Tank #5, for the period from March 1944 to March 1949, inclusive.

"Table 2 shows the montly ratios of evaporation losses between the standard pan and large tank, the mean average monthly coefficient to be applied to the standard pan to obtain evaporation from the large tank, the standard deviation of the mean, and the extreme ranges of deviation from the mean.

"A comparison was made of the relation between the monthly evaporation coefficient and corresponding monthly air temperatures by plotting graphically. A certain degree of correspondence was found; however, certain anomalies occurred which could not be explained using the known factors. Inasmuch as the relation of these factors seem quite complex, it is believed that, for the present, the simplest way to estimate evaporation from large open water bodies in this area is to multiply the average monthly coefficient listed in the table by the observed standard pan evaporation recorded by a pan in the vicinity of the lake or pond whose evaporation loss is desired.

"However, these results should be used with caution in view of the rather large difference between the observed ratios and the now generally used coefficient of 0.70. The present experiment should be continued over the next 5 years and studies made to make certain that local environmental conditions in the vicinity of the present set-up are applicable to the general conditions in South Florida before undisputed use is made of the newly established coefficients."

Table 1

Year and month	Evaporation		Monthly mean temperature			Average hourly wind	Monthly rainfall
	Open pan	Tank #5	Max.	Min.	Mean		
	Inches	Inches				Mph	Inches
Mar. 1944	5.577	4.832	82.9	58.3	70.6	4.7	1.73
Apr. "	6.648	5.684	85.2	61.1	73.1	4.9	4.13
May "	6.866	5.981	84.9	61.7	73.3	3.0	5.57
June "	7.114	5.831	91.8	68.0	79.9	2.6	3.48
July "	6.555	5.754	91.8	69.9	80.8	2.8	6.55
Aug. "	6.194	5.194	90.2	70.5	80.4	2.4	16.38
Sept. "	5.683	4.745	89.8	70.4	80.1	2.7	4.41
Oct. "	4.889	5.086	83.0	62.9	73.0	4.0	8.09
Nov. "	3.738	3.357	78.6	54.1	66.4	3.4	0.45
Dec. "	3.067	2.890	73.7	49.4	61.5	3.8	0.33
Jan. 1945	3.675	3.250	75.9	49.9	62.9	4.6	2.10
Feb. "	3.890	3.103	79.5	53.0	66.3	4.3	0.36
Mar. "	6.168	5.135	85.3	55.7	70.5	4.2	0.33
Apr. "	7.065	5.887	88.3	61.9	75.1	4.3	0.90
May "	7.416	6.624	87.8	59.7	73.8	4.0	2.52
June "	6.094	4.629	91.1	68.0	79.5	3.8	8.49
July "	5.727	4.701	90.0	69.3	79.7	2.7	13.05
Aug. "	6.477	5.120	90.5	70.6	80.5	3.1	6.28
Sept. "	5.441	4.355	88.9	71.3	80.1	4.4	10.38
Oct. "	4.371	3.848	84.7	67.9	76.3	3.2	2.81
Nov. "	4.253	4.462	78.3	57.1	67.7	3.8	1.52
Dec. "	3.037	3.058	74.3	51.9	63.1	4.0	1.91
Jan. 1946	3.202	3.180	75.8	53.0	64.4	3.7	0.73
Feb. "	4.564	4.221	78.1	54.4	66.3	4.6	0.52
Mar. "	5.611	4.812	80.8	57.9	69.4	4.8	7.06
Apr. "	7.600	6.338	84.3	57.9	71.1	4.0	0.01
May "	6.336	5.098	87.0	65.4	76.2	3.3	6.62
June "	5.773	4.941	88.0	68.7	78.4	3.0	9.70
July "	6.745	5.906	89.8	69.9	79.8	2.9	14.26
Aug. "	6.354	5.340	90.8	70.2	85.5	2.5	9.58
Sept. "	5.301	4.622	88.9	70.8	79.8	2.7	11.42
Oct. "	5.330	5.013	86.0	66.4	76.2	3.8	1.04
Nov. "	3.399	3.141	83.3	64.0	73.7	3.2	7.14
Dec. "	3.383	3.302	79.1	60.0	69.5	3.7	2.86
Jan. 1947	3.349	2.800	80.4	59.3	69.9	3.4	0.57
Feb. "	3.596	3.927	70.2	45.9	58.1	5.1	2.17
Mar. "	5.892	4.895	77.4	53.6	65.5	5.6	10.97
Apr. "	6.273	5.253	87.4	64.7	76.0	4.1	1.80
May "	6.767	6.191	87.9	64.3	76.1	3.5	5.34
June "	5.369	4.746	87.7	69.6	78.6	3.1	15.20
July "	5.111	4.782	88.2	70.8	79.5	2.9	14.22
Aug. "	5.948	5.496	90.9	72.6	81.8	3.5	6.53
Sept. "	5.172	4.672	88.2	72.9	80.5	7.5	15.35
Oct. "	3.759	3.670	84.4	69.5	76.9	4.7	7.23
Nov. "	3.423	3.446	82.2	65.7	73.9	5.0	3.94
Dec. "	2.986	2.976	76.4	58.8	67.6	4.2	1.36

(Con't next page)

Year and month	Evaporation: Open pan	Evaporation: Tank #5	Monthly mean temperature: Max.	Monthly mean temperature: Min.	Monthly mean temperature: Mean	Average hourly wind	Monthly rainfall
	Inches	Inches				Mph	Inches
Jan. 1948	2.637	2.490	72.0	54.5	63.2	5.5	4.63
Feb. "	3.842	3.089	79.4	56.2	67.8	4.1	0.66
Mar. "	6.150	4.469	85.1	61.5	73.3	5.8	0.89
Apr. "	6.093	4.840	83.9	62.6	73.3	5.5	8.22
May "	7.240	6.010	89.6	63.6	76.6	3.1	3.11
June "	6.954	5.678	90.9	67.9	79.4	3.0	3.84
July "	5.358	4.653	90.6	70.2	80.4	2.8	7.43
Aug. "	6.263	4.912	90.4	70.1	80.2	3.1	9.95
Sept. "	5.425	4.862	87.7	70.8	72.9	5.3	19.28
Oct. "	5.126	4.718	84.3	66.7	75.5	5.6	2.23
Nov. "	3.961	3.465	86.0	64.3	75.2	6.0	1.86
Dec. "	3.123	3.351	80.3	59.5	69.9	5.4	0.88
Jan. 1949	3.592	3.100	78.1	54.1	66.1	5.4	0.12
Feb. "	4.475	3.750	83.6	57.7	70.7	5.6	0.31
Mar. "	6.005	5.178	80.6	53.2	66.9	5.9	0.37

Table 2

Mo.	1944 %	1945 %	1946 %	1947 %	1948 %	1949 %	Average Coeffic-ient	Range of deviation %	Standard deviation %
Jan.		88.5	99.4	83.7	94.4	86.4	.905	-6.8 to 8.9	4.3
Feb.		79.7	92.5	109.1	73.4	83.8	.877	-14.3to21.4	9.3
Mar.	86.5	83.2	85.7	83.3	72.6		.823	-9.7 to 4.2	3.7
Apr.	85.5	83.4	83.4	83.8	79.6		.831	-3.5 to 2.4	1.6
May	87.0	89.3	80.5	91.4	83.0		.862	-5.7 to 5.2	3.0
June	81.8	76.1	85.7	88.5	81.8		.828	-6.7 to 5.7	3.2
July	87.5	82.1	87.8	93.5	86.7		.875	-5.4 to 6.0	1.8
Aug.	84.0	79.1	83.8	92.5	78.4		.836	-5.2 to 8.9	3.8
Sept.	83.5	80.4	87.2	90.3	89.5		.862	-5.8 to 4.1	2.8
Oct.	104.0	88.2	94.1	97.8	92.2		.953	-7.1 to 8.6	4.0
Nov.	89.9	105.9	92.4	101.0	87.7		.954	-7.7 to10.5	5.2
Dec.	94.2	100.5	97.8	100.3	107.2		1.000	-5.8 to 7.2	3.9

Drainage Studies - Ellis G. Diseker, Raleigh, North Carolina.- "Occasionally, the draw down pumps lose their prime and, even though each pump motor is equipped with a thermal overload switch, the motors may operate for 24 hours or more before the temperature rises high enough to break the circuit. Naturally, after the pumps lose their prime there is no load on the motors. Hence, excessive operation of the pumps and motors when not pumping causes undue wear on each and the pumps are void of water lubrication. Therefore, the writer figured out how safety cut-off switches could be installed. For each motor a regular automatic switch was inverted and installed, as follows: For the No. 1 pump (Gorman Rump Sump Pump), which is controlled by a mercury switch, flexible steel cable, float and counter balance, an elongated lever arm was soldered to a regular automatic electric motor switch. This switch was inverted and attached to the box enclosing the pump and motor so that the mercury switch lever arm would cut off the current when the pump lost its prime. This was possible because the water in the cistern would rush above the point at which the pump should start pumping, thus the float would rise and the stop on the cable would move upward to the extent that the mercury switch lever arm tripped the newly installed switch. On the No. 2 pump (Vertical Homart Cellar Drainer), the extra automatic switch was attached to the pump motor by means of a homemade circular band of sheet metal. An extra float rod was made from a 3/16" x 5.0' copper tube and inserted through a hole in the pump housing. The housing sufficed as a support or guide for the float rod. A brass toilet float bulb was purchased, but did not operate satisfactorily. Therefore, a float was made from a quart glass fruit jar. The float was attached to the lower end of the float rod and the upper end of the rod was inserted through the opening in the switch lever arm. Proper adjustments were made by inserting one cotter key in the rod above the switch arm and a key below the switch arm. This installation operates very satisfactorily, and when the foot valve, or the pump, becomes clogged with trash or loses its prime, the water in the cistern will rise above the maximum height to which the pump is supposed to start pumping. Thus, the extra float rises and stops the motor."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.- "Mr. Turner reports that soil permeability determinations have been completed for sites VA-148 through 151 and that cores are now on hand for completion of sites VA-152 and 157. During previous months, Mr. Turner has discussed the use of fiducial limits of the average rate of percolation. In the February report he discussed sampling for soil permeability determinations in detail. In considering the purpose of sampling he stated that from the standpoint of the usual procedure of sampling in a soil survey there is no important reason for including the symbols for the degree or degrees of soil permeability for the fiducial limits of the average rate of percolation. However, even if the sampling is not designed to measure variability for a soil type there is some advantage in revealing the variability of the volume of soil actually sampled.

"Let's consider two sites 120 feet apart; viz., sites No. VA-145 and 146. The symbols for the degrees of permeability for the several horizons are given in table 1.

Table 1.--Symbols for the degrees of permeability indicated by the rates of percolation for the soil horizons of Sites No. VA-145 and 146

	Symbols for degrees of permeability					
	Average rate of percolation		Lower fiducial limit		Upper fiducial limit	
Site No.	145	146	145	146	145	146
Horizon Col. (1)	(2)	(3)	(4)	(5)	(6)	(7)
A	6	7	4	1	7	7
B_1	6	7	5	1	6	7
B_2	4	4	1	1	4	5
C	3	3	2	2	3	3

"In columns (2) and (3) the degrees of permeability for these two sites agree for the B_2 and C horizons but not for the A and B_1. But as shown in columns (4), (5), (6) and (7) the degrees of permeability for the fiducial limits of the average rates of percolation for the A and B_1 horizons respectively of the two sites do overlap. Hence there is no significant difference indicated for the degrees of permeability for either horizon A or B_1 for the two sites. Therefore, these two sites in respect to the degree of permeability of the soil horizons are not significantly different.

Data Analyses.-"Mr. Kirkpatrick, who was on leave during the early part of the month, has continued a study of the Chatham data and based on the early analysis makes the following observations:

"From previous work with the data from Chatham, it becomes evident that (1) Runoff frequency data are of too short a duration. They need to borrow strength, possibly from longer periods of rainfall; (2) size factor cannot be isolated by direct comparisons of these data due to dissimilarity of cover, soils, permeability, etc. The concensus of opinion is that (1) thru hydrograph analysis curves can be derived of rate of runoff vs. water (in the units of 'Surface inches') needed to lubricate and provide head to cause such flows. The slope and position of these curves represents the efficiency of the watershed drainage system; (2) thru the application of these drainage efficiencies of the various watersheds to a given storm or by direct comparison of these drainage efficiencies a size factor could be developed; (3) similarly, but of somewhat more complex application, soil and cover factors can also be developed.

"From a small amount of work done thus far, it becomes apparent on W-III watershed that the drainage efficiency decreases as the tobacco row becomes ridged or emphasized through cultivation. Apparently the emphasized tobacco rows act as additional more frequent terraces which postpone concentration of flows, thus changing the drainage system."

Supplemental Irrigation Studies - James Turnbull, Lake Alfred, Florida.-"Measurements were made during April to determine the amount of new stem growth which had developed on our irrigated and unirrigated plots on the Experiment Station grounds. In all cases there was considerably more growth on the irrigated plots than on the unirrigated plots. Table 1 shows the amounts of growth measured.

Table 1.--Average new stem growth

Variety	Irrigated	Unirrigated
	Inches	Inches
Marsh grapefruit	3.33	0.19
Duncan grapefruit	2.80	.16
Hamlin orange	2.99	.51
Pineapple orange	3.37	1.09
Valencia orange	3.46	.91

"The Valencia oranges on the irrigation plots at Haines City were picked during the month. The results, which are disappointing, are shown in table 2. Irrigation was applied to these plots in June and November 1948 and in February 1949.

Table 2.--Fruit yield in boxes per tree
Dr. Sample Estate Grove - Haines City, Fla.
1948-49

	Valencia oranges		
Irrigation application	1st Series Plots	2nd Series Plots	Average
0 "	5.85	5.58	5.72
1-1/2"	5.64	5.98	5.82
2-1/2"	5.57	6.42	5.96
3-1/2"	5.95	5.85	5.90

"There was little rain until the last few days of the month. Heavy rain on April 29-30 forestalled irrigation. The water level in Lake Confusion

and the ground-water level dropped during the month. Table 3 shows the relative elevations of the water table and lake level on April 25, 1949

Table 3.--Elevation of water table and lake levels
Dr. Sample Estate Grove, April 25, 1949

Station	Location	Water Elevation	Ground Elevation
Lake Confusion		128.42	
Well No. 6	100' West of Lake	127.79	137.5
Well No. 5	200' West of Lake	127.86	142.8
Well No. 4	300' West of Lake	127.85	147.0
Well No. 3	400' West of Lake	127.93	150.1
Well No. 2	500' West of Lake	127.91	152.0
Well No. 1	600' West of Lake	127.95	155.0

"From table 3 it can be seen that the slope of the water table is towards the lake but at a lower elevation than lake level, indicating that the lake is not recharging the ground water table."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Ga.- "I presented a paper, 'Supplemental Irrigation in Georgia,' at the meeting of the Georgia Academy of Science, Emory University, April 22."

IRRIGATION DIVISION

Lining of Irrigation Canals and Ditches, R-3-2-3.-Mr. Lauritzen reports that an inspection of lining installations at Richmond and North Logan show evidence of very little winter deterioration for any of the experimental linings. Sealing of the section of precast concrete slabs at Richmond was completed. This finishes the construction work on the Richmond Field Test.

A number of seepage measurements were made on the Logan Northern Canal in the vicinity of the River Laboratory. Data has not been fully assembled as yet, however, losses were found to be heavy.

A manuscript entitled, "Linings for Canals and Reservoirs," was prepared and approved for publication in Farm & Home Science.

A conference was held with the Bureau of Reclamation Officials in Salt Lake City, relative to future cooperation and a program for 1949. The Bureau indicated that they were well pleased with the work which was done during the past year and will be interested in continuing with their cooperation.

Management of Related Irrigation and Drainage Enterprises, R-3-5-1 #3.-Mr. Maughan reports that irrigation water for the Cub River Irrigation Company Area is derived from both gravity diversion and pumping. The gravity supply comes from Cub River to the East, a branch of Bear River to the West, from which the pumped supply is received. The water is pumped by electric power through a 90-foot lift and pumping is resorted to about the end of June to supplement the decreasing gravity flow.

In 1946, about an average year, the Company received a total supply of 26,683 acre-feet for the irrigation season. To the 28,000 acres served by the Company, this distributed makes a supply of about 1 acre-foot per acre. Added to this the yearly precipitation of about 1.5 acre-feet makes a total water supply of only about 2.5 acre-feet per acre.

This available water obviously represents a very economical use of water which is made possible by the nature of the soils and the practice of subirrigation, common in the Cub River Irrigation Company Area. In general, the water supply is considered by farmers to be adequate. The southern section, where most of the irrigation is located, is highly productive and is one of the best farming areas of Utah.

Arizona.-Mr. Houston reports that the past six years of continuous drouth in Arizona came to an end during the past snow season. Generally the outlook for water in the irrigated areas of the State for the 1949 season is very good. As of April 1 the water held in the eight important reservoirs was 30 percent of capacity or three times the amount of water stored on April 1, 1948. San Carlos Reservoir which was practically empty last year, contained about 25 percent of capacity on April 1. The extremely

heavy snow storms of January and February combined with low temperatures retained a record snow pack upon the higher elevations throughout the winter. The water content of the snow remaining on the principal watersheds was over 200 percent of normal on April 1. This would indicate that, with normal precipitation, continued good runoff will result.

Colorado.-Mr. Rohwer reports that the April 1 snow reports for the Colorado, Missouri-Arkansas and Rio Grande drainage basins were issued on April 11 and 12. The greatest depths of snow were measured on the courses on the North Platte, Rio Grande, San Juan and Dolores watersheds. Recent snow surveys indicate that snow accumulation during April has been below normal but the snow cover is still unusually heavy on some of the highest courses. There has been considerable melting at lower elevations.

Idaho.-Mr. Criddle reports that during the month of April regular snow surveys were made on the Payette, Salmon and Boise Rivers from the Boise office and a 37-page report entitled "Snow Surveys and Irrigation Water Supply Forecasts," was released on April 9. This report contained the following summary statement:

"Snow cover throughout Columbia Basin has remained high all winter. Surveys made on April 1 show a snow water content varying from slightly below normal in the comparatively small area of the Big Lost River Drainage of Idaho to more than twice normal in the Willamette Valley of Oregon. For the basin as a whole, the snow cover is heavier this year than for any previous year of record. The greatest above normal snow cover is in the Cascades of Oregon and Washington. Abnormally heavy snow exists in Northern Idaho and Western Montana. Damaging high water is still expected on many of the various drainages."

Montana.-Mr. Codd reports that snow surveys and irrigation water forecasts were summarized and issued as a bulletin as of April 1, 1949.

Nevada.-Mr. Houston reports that irrigation season water supplies will range from fair in Western to excellent in Eastern Nevada. Snow water runoff of Eastern Nevada streams will vary from 70 percent to 100 percent of normal, while Humboldt Basin streams will flow from 100 percent to 200 percent. Ground water levels continue low and sub-normal temperatures have retarded early season streamflow. Reservoir storage is poor with total storage on April 1 about 80 percent of last year, 45 percent of the 1938-47 average, and 35 percent of the usable capacity. Under normal weather conditions during the summer all reservoirs except Tahoe should fill. Lake Mead contained about 95 percent of last year's storage on April 1.

Assistance to Operations and other irrigation interests by the members of the staff of the Research Division of Irrigation and Water Conservation was rendered during the month of April as follows:

V. S. Aronovici, California.-One week was spent with Eldred Bliss in testing the adaptability of Utah Scientific Research coring device to varying soils and soil conditions in southern California soil conservation districts.

To summarize these results, this coring device appears to be highly effective for securing good cores for observation of soil structure in the field. The quality of the core is controlled by the soil moisture percentage of the soil. It appears that the core is not subject to excessive compaction. The problem of returning these cores to the laboratory and setting them up in permeameters is complex. Time requirements for setting up the rig, taking the core and removing from the soil is time consuming, and would not appear to be economical for use on an extensive survey program. If a method is developed whereby the cores may be studied in the laboratory or extreme detail of structure is desired for study, the equipment is ideal. Four or five six-foot cores with two operators was found to make a full day.

Harry F. Blaney, California.-Upon request of District Conservationist, Mr. Blaney attended a conference of Operations and reviewed the results of 1947-48 farm irrigation study involving 25 farms. Problems reported included irrigation efficiency, depth of water applied and penetration, soil moisture-holding capacity, length of run and frequency of irrigation.

Dean C. Muckel, California.-At the request of John Wittwer, County Agent at Las Vegas, Nevada, Mr. Muckel made a trip over the Meadow Valley Wash in Clark County to determine the possible use of the method of water spreading for control of flash floods. A report is to be prepared covering his findings.

Wayne Criddle and Morland Nelson, Idaho.-At the request of the Utah Soil Conservation Service state office, Mr. Criddle and Mr. Nelson met with various state and regional S.C.S. technicians in Salt Lake City on April 21 to discuss plans for an irrigation training school to be held in the vicinity of Salt Lake City this coming summer. An irrigation guide now under preparation for the State of Utah was reviewed some and certain changes suggested. It is anticipated that at the time of the training school that a number of other refinements will be made to this irrigation guide.

John S. James, Montana.-Mr. James has prepared a report for the Harden Drainage Project in Big Horn County, Montana. During April, requests were received for study of group drainage projects involving about 15,000 acres. Preliminary examination of these projects is in progress.

J. Howard Maughan, Utah.-One day was spent with leaders of the Cub River Irrigation Company inspecting a newly formed arroyo draining from the project area into Bear River. This accelerated erosion is the result of seepage water draining from the saturated unstable sandy soils overlying the area. It is undoubtedly caused by increased irrigation in the area during recent years. The remedy lies in canal lining to prevent seepage losses and more efficient irrigation to prevent deep percolation from irrigation.

Ivan D. Wood.-During April Mr. Wood participated in several farm group meetings including a training course for G.I. students specializing in irrigation and meetings arranged by soil conservation districts and College Extension Services in Colorado, Nebraska, and Texas.

Water Spreading for Storage Underground - A. T. Mitchelson, Dean C. Muckel, Hayden K. Rouse, E. S. Bliss, Curtis E. Johnson.-During the month of April micro-organism counts were made at frequent intervals on three (3) ponds selected for study. No definite relation has been found between the micro-organism population in these ponds and the percolation rates. It is possible, however, that fluctuation in numbers of certain specific groups of organism may have escaped detection in the studies of total counts that were made.

A study was initiated to determine the composition of the flocculent precipitate which collects on the bottom of ponds. This material was found to be made up largely of diatoms, somewhat cemented with carbonates. The effect of this substance on percolation rates has not been determined.

Organic matter determinations were made in order to determine how much the organic matter content of the soil is increased by additions of plant residues. The rate at which the organic matter is lost will also be studied.

Installation of the replicate set of buffer ponds was completed on April 1, however actual operation was delayed until April 14 when the Uhland type soil sampling equipment was obtained and the new ponds sampled. The plan of operation approved provides for operation of the replicate ponds in the same manner as for the first phase of the original installation.

Stephen J. Mech reports.-Irrigation water was turned into the pump canal on April 13. When the delivery became more dependable 36-plot irrigations were made beginning on April 18. The soil moisture for the 4-foot depth averaged about 14.5 percent. This is about 60 percent of the capacity available for plant use. The third and fourth foot were roughly 11 - 13 percent. This is somewhat lower than expected for a field which was in late potatoes last year and received the winters precipitation too.

Soil losses were quite high even though it was more than a month since the soil was last disturbed. Apparently, time alone is inadequate to

consolidate loose soil to an extent sufficient to decrease erosion. The compacting effect of water is also required for maximum consolidation of the detached soil.

All plots were cultivated the last week of April. A wheel hoe with a disk attachment was used to cut away the soil from the row in preparation for blocking and thinning.